

Guide to the Best Astronomical Software



We suffer from an embarrassment of riches. There is so much good astronomy software available for personal computers that it's a challenge to find the "best program."

This guide lists my favorite general-purpose programs. All will chart the sky — often in incredible detail — and show the Sun, Moon, and planets for any date and from any place on Earth.

By John E. Mosley

They will identify the constellations, draw coordinate grids, plot thousands of stars, galaxies, and nebulae, and show comets and perhaps major moons. Some will let you search for eclipses, and a few can whisk you away to view the sky from other planets.

While some programs are specific to a computer operating system, increasingly more of them come in cross-platform

versions. Each entry notes whether the program runs with DOS, Windows, or MacOS. Many of these programs need specific hardware such as extra memory or a CD-ROM drive. The month and year following the description refer to the issue of *Sky & Telescope* that features a review, often of an earlier version. Manufacturers and distributors for these and other programs are listed on page 96. Products marked with an asterisk are available from Sky Publishing Corp.

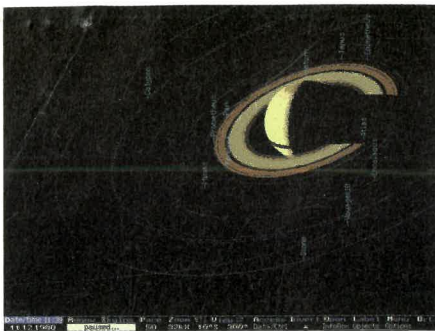
This listing does not include special-purpose programs optimized for certain functions such as plotting eclipse paths, maintaining an observing log book, or studying the orbits of binary stars. Nor does this guide include CD-ROMs that are audio-visual tours of the sky. Check my reviews in past issues of *Sky & Telescope* for suggestions on what to buy (and what to avoid).

▲ These are some of the many titles in the universe of astronomical software.

There is also a lot of free and "shareware" (try-before-you-buy) software on the World Wide Web. Some of the programs here have shareware versions or evaluation copies you can download. A good place to start your search is at SKY Online (<http://www.skypub.com/>) — look under the Astronomical Software heading in the SkyLinks section.

I maintain a comprehensive list of commercial software (with some shareware programs), which I update monthly. It is posted on SKY Online. Readers can also receive a printed copy by sending \$2 (\$5 overseas) to John Mosley, 7303 Enfield Ave., Reseda, CA 91335.

Dance of the Planets (ARC Science Simulations). Sophisticated orbital simulation of all planets, moons, comets, and

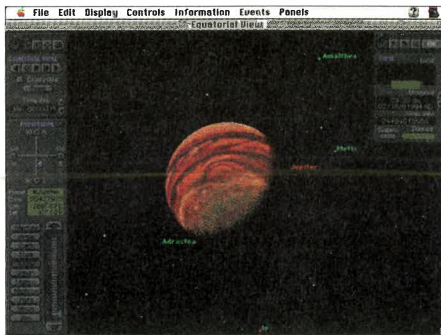


Dance of the Planets

asteroids; displays up to 380,000 stars; computes mutual gravitational interactions; optional calculating almanac finds conjunctions and eclipses. \$95.00 (December 1989, June 1992). DOS.

Deep Space (David Chandler Co.). Prints custom star charts using up to 15 million stars, 10,000 deep-sky objects, planets, and 10,000 comets and asteroids; offers large selection of map projections; maintains observing notes on deep-sky objects; plots orbits, finder charts, visibility charts for comets, asteroids, and planets with 3-D options; supports several telescope interfaces. \$129.00 (November 1987, March 1992, October 1995).* DOS.

Earth Centered Universe (Nova Astro-nomics). Inexpensive sky simulation

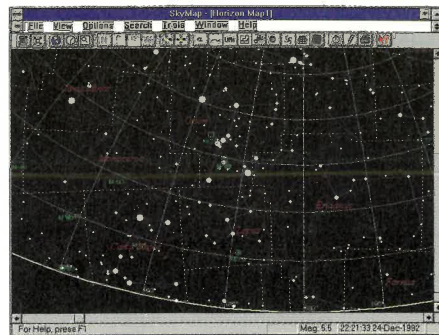


RedShift 2

objects, 45,000 variable and suspected variable stars, and many more objects from several catalogs; includes accurate planet positions and phases and 10,000 comets and asteroids. \$69.00 (January 1994, August 1996). DOS and Windows 3.1, 95, and NT.

Observer (Procyon Systems). Offers 15 million stars and 100,000 deep-sky objects from more than 12 catalogs; supports leading telescope interfaces. \$69.95–\$299.95, depending on the version (October 1995). MacOS.

PC-Sky (CapellaSoft). Shows realistic views of the sky as seen naked-eye, through binoculars, and with telescopes of different sizes; includes stars to magnitude 7.5 (with fainter stars in selected areas), planets except Pluto, 20



SkyMap

Penguin Dictionary of Astronomy, and low-resolution surface maps of Moon, Venus, Earth, and Mars. \$59.00 (February 1994, August 1996). Windows 3.1 and MacOS.

SkyChart 2000.0 (Southern Stars Software). View the sky from anywhere in (or near) the solar system; includes 10,000 deep-sky objects and 34 moons; searches for eclipses and conjunctions; plots Earth-orbiting satellites; displays precession and proper motion. \$34.95 (March 1995, April 1997). Windows 3.1 and 95 and MacOS.

SkyMap (Jasc, Inc.). Sky-charting program includes up to 259,000 stars, 10,600 deep-sky objects (with detailed descriptions), more than 100 comets and asteroids; auxiliary Image Viewer

Today's software packs a lot of punch for both armchair and advanced-amateur astronomers

with up to 15 million stars; more than 10,000 deep-sky objects shown at proper orientation and scale, and 30,000 comets and asteroids; can add observing notes; supports Meade LX200 and popular digital setting circles. \$50.00 (September 1994). Windows 3.1 or 95.

Guide (Project Pluto). Displays detailed charts that include 15 million stars and more than 84,000 deep-sky

moons, and 202 deep-sky objects. Accompanying telescope views and diagrams plot 6,000 double stars, 400 binary stars, and 1,000 variable stars. \$99.00 (June 1993). DOS.

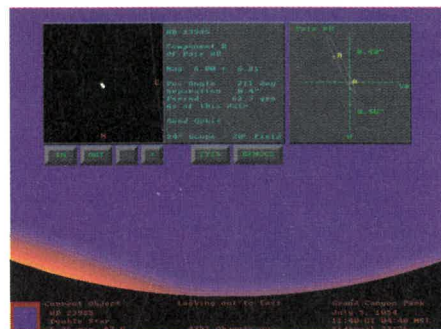
RedShift 2 (Maris Multimedia, Inc.). Shows 259,000 stars and 40,000 deep-sky objects from any point in solar system; calculates precise planet positions; includes 700 full-screen photographs,

lets you link pictures to the database. \$49.00 (April 1995). Windows 3.1, 95, and NT.

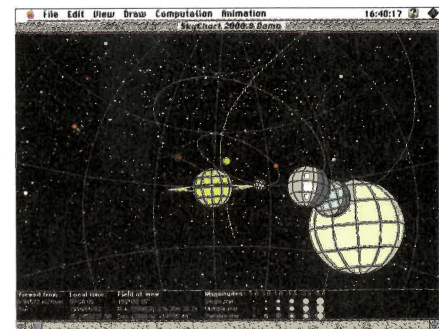
Starry Night Deluxe (Sienna Software). Shows 15 million stars and deep-sky objects; photorealistic simulations of the sky from planets and moons; detailed planet surfaces; eclipses; comets with tails; atmospheric effects; Orbit Editor lets you place bodies into orbit



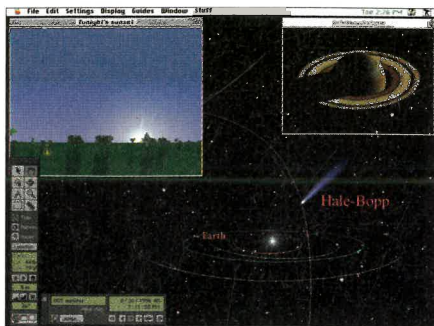
Guide



PC-Sky



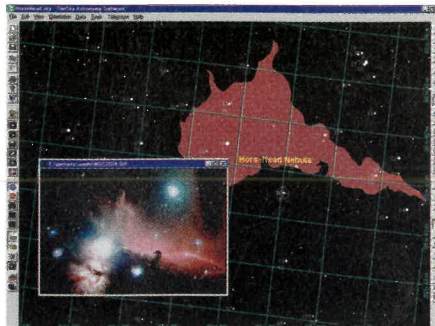
SkyChart 2000.0



Starry Night Deluxe

around any object; calls up images from Digitized Sky Survey via the Internet; controls Meade LX200 telescopes; database editor; makes QuickTime movies. \$89.95 (May 1996).* MacOS (forthcoming Windows 95 version).

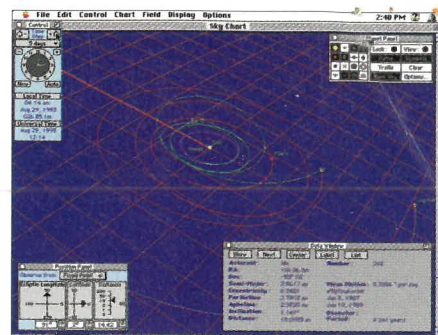
TheSky (Software Bisque). Displays 15 million stars, 16,000 double stars, 42,000 variables, more than 100,000 deep-sky objects (galaxies are plotted to scale with correct orientations); thousands



TheSky

of asteroids and comets; finds eclipses and conjunctions; 650 images. Optional *ImageLink* utility matches objects in CCD images or scanned photographs to objects in *TheSky*'s database. \$129-\$249 (January 1992, April 1997).* Windows 3.1 and 95 (forthcoming MacOS version).

Voyager (Carina Software). Includes 15 million stars, 10,000 deep-sky objects, 28,000 variable stars, 20,000 double



Voyager

stars, and 800 photographs; can view from any point in or near solar system; plots eclipse tracks on Earth; finds conjunctions; view nearby stars in 3-D. \$159.50 (December 1988, September 1993, October 1995).* MacOS (forthcoming Windows 95 version). ★

JOHN MOSLEY supervises the educational programs at Griffith Observatory in Los Angeles. He welcomes e-mail at jmosley@griffithobs.org.

Selected Astronomical Software Publishers

Academic Software Library

P.O. Box 8202, North Carolina State University, Raleigh, NC 27695; 800-955-8275.

Andromeda Software, Inc.

P.O. Box 605, Amherst, NY 14226-0605; fax: 716-691-6731; 70731.2657@compuserve.com.

ARC Science Simulations

P.O. Box 1955, Loveland, CO 80539; 970-663-3223; arcmail@arcinc.com; <http://www.arcinc.com/>.

AstroMicro

104 Rang Ste-Catherine, Yamaska, QC J0G 1X0 Canada; merid@cam.org.

Astronomical Society of the Pacific

390 Ashton Ave., San Francisco, CA 94112; 415-337-2624, fax: 415-337-5205.

Astrosoft

2401 Tee Circle #105/106, Norman, OK 73069; 405-364-0858, fax: 405-447-3337.

Axiom Research, Inc.

1304 E. 8th St., Tucson, AZ 85719; 602-791-2864.

Bdw Publishing

P.O. Box 818, Florissant, CO 80816; 719-748-8083; 71511.515@compuserve.com.

Berry, Richard

22614 N. Santiam Hwy., Lyons, OR 97358; phone/fax: 503-859-3030.

Bondono Software

51054 Kingwood, Shelby Township, MI 48316; 313-731-4706.

Brøderbund

P.O. Box 6121, Novato, CA 94948-6121; 415-382-4400, fax: 415-382-4582.

Bruce Johnston Computing

7764 Tull Court, Waterford, MI 48327; 805-966-6693.

CapellaSoft

P.O. Box 3964, La Mesa, CA 91944; 619-460-8265, fax: 619-463-6067; crinklawn@n2.net.

Carina Software

12919 Alcosta Blvd., Suite 7, San Ramon, CA 94583; 510-355-1266, fax: 510-355-1268; CarinaSoft@aol.com.

C.E.B. Metasystems Inc.

1200 Lawrence Dr. #175, Newbury Park, CA 91320; 800-232-7830, fax: 805-498-5987; cebs@star-gaze.com.

Contact Software

725 Stanbridge St., Norristown, PA 19041; 610-341-5945, fax: 610-341-1460; dbradstr@beacon.eastern.edu.

Cyanogen Productions

25 Conover St., Nepean, ON K2G 4C3, Canada; 613-225-2732.

David Chandler Co.

P.O. Box 309, La Verne, CA 91750; 909-988-5678, fax: 909-988-5618; dschandler@frumbl.claremont.edu; <http://www.cs2.com/dschandler/>.

E.L.B. Software

8910 Willow Meadow Dr., Houston, TX 77031; 713-541-9723; elb@ix.netcom.com.

Etalon Software

2550 Parkview Dr., Longmont, CO 80501; phone/fax: 303-702-9274; info@etlon.com; <http://www.etlon.com/>.

Expert Software

800 Douglas Rd., North Tower, Suite 750, Coral Gables, FL 33114-4506; 305-567-9990, fax: 305-443-0786; <http://www.expertsoftware.com/>.

Fremont, Jim

6646 Alcove Ave., North Hollywood, CA 91606; 818-760-8178.

Gemini Software

502 Holly, Fayetteville, AR 72603; 501-442-4159.

Hopkins Technology

421 Hazel Lane, Hopkins, MN 55343-7116; 612-931-9376; <http://www.hoptechno.com/>.

Jasc Inc.

P.O. Box 44997, Eden Prairie, MN 55344-2697; 800-622-2793; orders@jasc.com.

KlassM Software

4060 Farrell Rd., Dexter, MI 48130; 800-968-4994, fax: 313-426-5533; 75020.1431@compuserve.com.

Maris Multimedia, Inc.

4040 Civic Center Dr., Suite 200, San Rafael, CA 94903; 415-492-2819; redshift@maris.com; <http://www.maris.com/>.

MathSoft Inc.

101 Main St., Cambridge, MA 02142; 800-628-4223, fax: 617-577-8829.

Maxis

2121 N. California Blvd. #600, Walnut Creek, CA 94596-3572; 800-526-2947, fax: 510-253-3736; <http://www.maxis.com/>.

Meade Instruments Corp.

16542 Millikan Ave., Irvine, CA 92714; 714-756-2291, fax: 714-756-1450; <http://www.meade.com/>.

Mensys

Craynestersingel 65, NL-2012 PG Haarlem, The Netherlands; +31-023-5470837, fax: +31-023-5471196; mensys@euronet.nl.

Microprojects

296 Spring Garden Ave., North York, ON M2N 3H3, Canada; 416-221-8579; mpj@magic.ca.

NASA CORE

Lorain County JVS, 15181 Rte. 58 South, Oberlin, OH 44074; 216-774-1051 x293, fax: 216-774-2144; nasaco@leeca8.leeca.ohio.gov; <http://www.spacelink.msfc.nasa.gov/CORE/>.

National Space Science Data Center

Code 633, Goddard Space Flight Center, Greenbelt, MD 20771; 301-286-6695, fax: 301-286-1635; request@nssdca.gsfc.nasa.gov; <http://nssdc.gsfc.nasa.gov/>.

Network Cybernetics

4201 Wingren Rd., Suite 202, Irving, TX 75062-2763; 214-650-2002, fax: 214-650-1929; info@ncc.com; <http://www.ncc.com/ncc/>.

Nova Astronomics

P.O. Box 31013, Halifax, NS B3K 5T9, Canada; 902-443-5989; dlane@hercules.stmarys.ca; <http://fox.nstn.ca/ecu/ecu.html>.

NRSpace Software

P.O. Box 30864, Seattle, WA 98103; 800-548-7766, fax: 206-783-9296; <http://www.nrspace@msn.com/>.

Palladium Interactive

3 Harbor Dr., Suite 301, Sausalito, CA 94965; <http://www.palladiumnet.com/>.

Parallax MultiMedia

1233 Saddle Court, Auburn, CA 95603; 800-884-0225, fax: 916-887-8729; parallax@aol.com.

Personal MicroCosmos

8547 E. Arapahoe Rd., Suite J-147, Greenwood Village, CO 80112; 303-753-3268; 73667.3517@compuserve.com.

Pickering Anomalies

P.O. Box 1214, Belmont, CA 94002; jim@anomalies.com.

picoScience

41512 Chadbourne Dr., Fremont, CA 94539; 510-498-1095.

Procyon Systems

1322 Augusta National Blvd., Winter Springs, FL 32708; 407-366-5985; observer@procyon-sys.com; <http://www.procyon-sys.com/>.

Project CLEA

Dept. of Physics, Gettysburg College, Gettysburg, PA 17325; 717-337-6028; <http://www.gettysburg.edu/project/physics/clea/cleahome.html>.

Project Pluto

168 Ridge Rd., Bowdoinham, ME 04008; 207-666-5750; b.gray2@genie.geis.com; <http://www.projectpluto.com/>.

Rainman Software

100 Shale Place, Charlottesville, VA 22902-6402; 804-984-2808, fax: 804-984-1241; rainman@rainman-soft.com.

Romtech

2945 McMillian Rd., #128, San Luis Obispo, CA 93401; 805-545-8515, fax: 805-781-2259; tech@romt.com; <http://www.romt.com/>.

Sienna Software

538-366 Adelaide St. E, Toronto, ON M5A 3X9, Canada; 416-410-0259, fax: 416-410-0359; contact@siennasoft.com; <http://www.siennasoft.com/sienna/>.

Software Bisque

912 12th St., Suite A, Golden, CO 80401; 303-278-4478, fax: 303-279-1180; smb@bisque.com; <http://www.bisque.com/thesky/>.

Software Systems Consulting

615 S. El Camino Real, San Clemente, CA 92672; 714-498-5784, fax: 714-498-0568; <http://www.sscorp.com/>.

Southern Stars Software

12525 Saratoga Creek Dr., Saratoga, CA 95070; phone/fax: 408-973-1016; sthnstars@aol.com; <http://www.netsys.com/sthnstars/>.

Stellar Software

P.O. Box 10183, Berkeley, CA 94709; 510-845-8405, fax: 510-845-2139.

TASA Graphic Arts

11930 Menaul Blvd. NE, Suite 107, Albuquerque, NM 87112-2461; 505-293-2727, fax: 505-293-5757; tasagraph@aol.com; <http://www.swcp.com/~tasa/>.

Waldee-Wood Astronomical Software

4057 Luneta Dr., San Jose, CA 95136; 408-723-3655, fax: 408-723-2944; apodizing@juno.com; <http://www.netcom.com/~regina-r/astro.html>.

Walnut Creek CDROM

4041 Pike Lane, Suite D-893, Concord, CA 94520; 800-786-9907, fax: 510-674-0821; orders@cdrom.com; <http://www.cdrom.com/>.

Willmann-Bell, Inc.

P.O. Box 35025, Richmond, VA 23235; 804-320-7016, fax: 804-272-5920; <http://www.willbell.com/>.

Zephyr Services

1900 Murray Ave., Pittsburgh, PA 15217; 800-533-6666, fax: 412-422-9930; mail@zephyrs.com; <http://www.zephyrs.com/>.

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P.O. Box 1814, Camarillo, CA 93011-1814
INTERNET: 72401.3174@CompuServe.com
<http://ourworld.compuserve.com/homepages/johnerogers>

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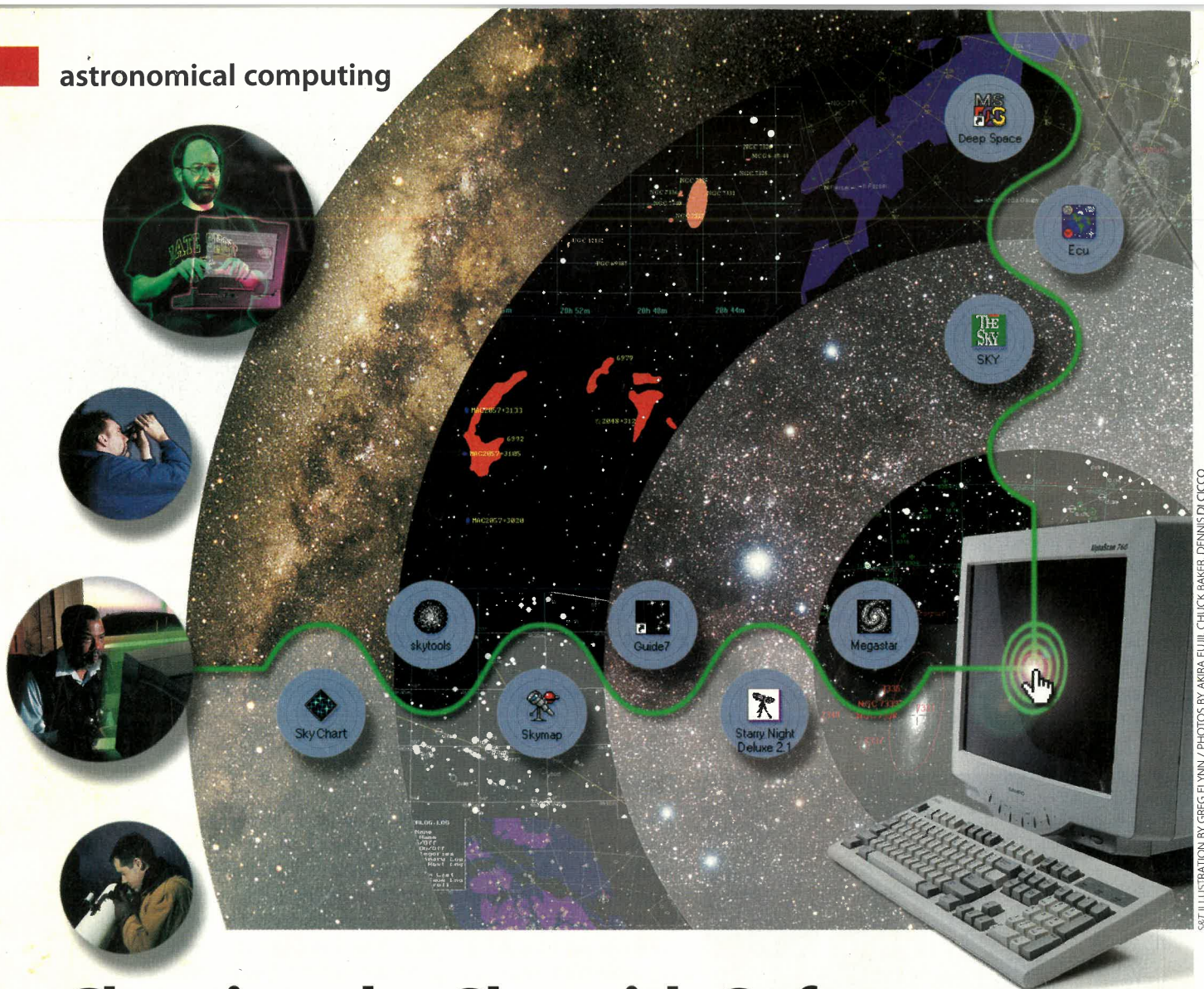
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Charting the Sky with Software

An evaluation of several computerized star mappers. | By Jeff Medkeff

ASTRONOMY IS A DATA-INTENSIVE hobby. If you don't believe me, pick a page from any celestial atlas in your possession and begin counting the plotted stars and deep-sky objects. Even charts limited to naked-eye stars offer thousands of objects; detailed works like the *Millennium Star Atlas* have counts in the millions. It's no surprise that over the last decade or so, a variety of computer programs have been developed to handle all these data and create custom star charts for the amateur observer.

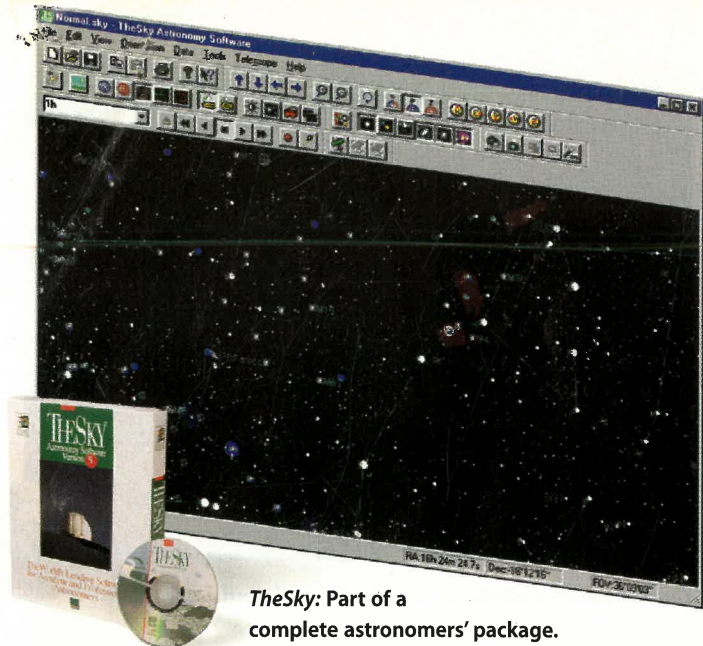
The quantity of this software is impressive. Bill Arnett's Planetarium Programs Web page (www.seds.org/billa/astrosoftware.html) lists more than 70 planetarium, star-charting, and solar-system simulation programs. They range

from simple utilities to robust celestial cartography applications rich with features. But with so much to choose from, the question quickly becomes, which one to select? This review doesn't pretend to cover all the choices (not even all worthy programs, unfortunately), as that would fill the pages of an entire *Sky & Telescope* issue. The examples I discuss here are based on personal familiarity and preference. I selected 10 software packages for a head-to-head comparison.

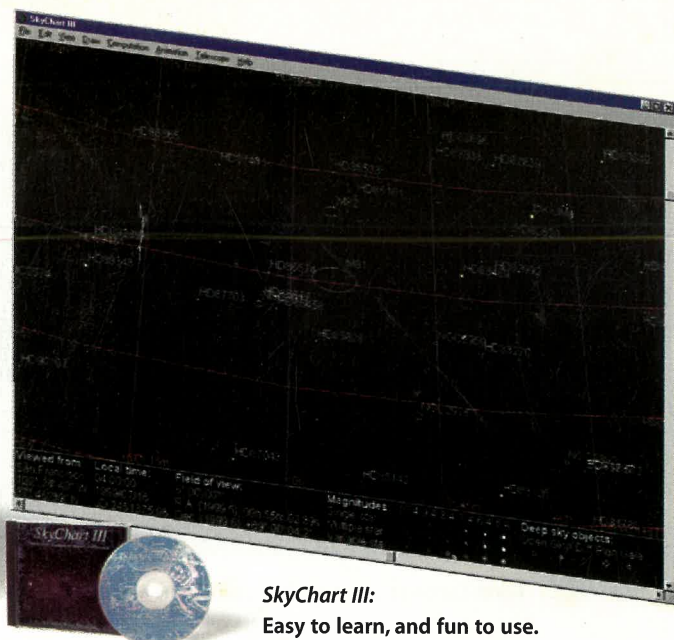
The evaluated programs share certain common features. Just as all new cars have wheels and seat belts, all of today's sky-charting software includes millions of stars (from the *Hubble Guide Star Catalog*); thousands of deep-sky objects (the entire NGC and IC catalogs); positions of the Sun, Moon, and planets for

centuries into the past or future; the ability to input new comets and asteroids; the capability to filter displayed objects by magnitude; the ability to show overlays of eyepiece fields of view; and, of course, the capability to print the charts. Such standard features won't be commented on further.

But various titles have different options. Many programs can interface with telescopes (see the February issue, page 72), import supplementary object catalogs, or filter the data into lists. Some of these options are summarized in the table on page 80. To touch on the differences of the programs, I'll run through each one briefly, commenting on its good and bad points, and suggest the observing styles or specialized tasks to which it is best suited.



TheSky: Part of a complete astronomers' package.



SkyChart III: Easy to learn, and fun to use.

The Players

TheSky,* from Software Bisque, now with a new Version 5, offers a premium set of data sources and bears a full complement of advanced features. Its charts are attractive, accurate, and flexible. The interface is not hard to use though there is room for improvement, particularly in the filter controls, which determine what is plotted on the map, and the object information boxes. While *TheSky* had recently lagged in incorporating new capabilities, the latest version has closed the gap.

However, its star-charting functions tell only part of the story. Several optional programs that make up *TheSky Astronomy Suite* can be linked with the main program to boost its utility. (These add-ons are not available for the new MacOS version.) The suite includes *T-Point*, an exceptionally rigorous mount-error-modeling system that improves the pointing accuracy of computer-interfaced telescopes; a scripting program called *Orchestrate* for robotic telescope control; and the camera-control and image-processing software *CCDSOFT*. Combined, they make a peerless robotic-telescope and camera-control package that I found exceptionally powerful yet easy to use. Each component performed as advertised with no fuss. The excellent documentation helped make using these applications easy and trouble free. If robotic control or mount-error mod-

eling is needed, there is no substitute for *TheSky* and its accessory programs.

The primary drawback to *TheSky* is its price. Standing alone, it is the most expensive traditional charting program reviewed here, about two or three times the cost of several programs that provide nearly identical feature sets (even the more basic Levels II and III are more than several other superior programs). The cost of *TheSky* is still less than buying printed atlases, ephemerides, and other resources separately, so it represents good value. But if you need powerful charting software and telescope control, without robotic and error-modeling capabilities, you might want to get another product and save some money for other accessories.

SkyChart III* is a workhorse program, lean and efficient throughout. Maps are drawn quickly, and the easy-to-learn interface allowed me to become proficient

in zooming and slewing the map within minutes of installation. The handy single-click, pop-up information box for deep-sky objects sets this as a strong contender in the star-charting arena. Advanced features I was pleased to find include easy-to-use animation control and the ability to select the precision of the program's plotting calculations.

Some astronomical software has features that, though graphically impressive and fun, are of little importance at the telescope. *SkyChart III* doesn't fall into the trap of sacrificing usefulness for glitz. It generates custom charts well. It also offers other practical utilities for the observer such as a conjunction finder and tracking artificial Earth satellites. The core functionality is supplemented with the ability to set your observing perspective to different locations in the solar system. But these more entertaining features do not overwhelm *SkyChart III*'s power and simplicity.

New to the star-map scene is **SkyTools**,* a combined star-charting, observation-planning, and logging program from CapellaSoft. The charting is very capable and uncluttered, and generates maps perfect for use at the telescope. Most interestingly, *SkyTools* gives the user a great deal of control over the map projection, generating distinct styles for various purposes. It has several special charts, including a handy three-part view of the entire sky that reduces distortion. In all, I found the charting functions in this program unexpectedly flexible.

But it's in the observation-planning and logging areas that *SkyTools*

*Available from Sky Publishing.



SkyTools: New kid on the block has unique charts.



really shines. The program provides a handy graphical representation of the diurnal motions of the objects selected to see when the best observation window occurs. The tools are all the more powerful because they allow extensive customization. For example, I planned observations taking the Moon into account, as well as the altitude of the object and a host of other variables, all of which I could select from drop-down menus. Even compared to dedicated observation-planning software, this program shows itself to be powerful, flexible, and, perhaps most important, easy to learn.

Nova Astronomics' **Earth Centered Universe** also offers capable charting without bogging itself down with features that are more fancy than useful. *ECU* has an easy-to-use interface and it runs fast. This speed advantage holds even on older hardware since it runs with Windows 3.1 as well. Those with an older computer might give this program some thought, because *ECU* also allows the user to select the precision of the calculations and thus offers some control over its execution speed.

This program is not well suited to the person who wants to hunt down 15th-magnitude galaxies, nor does it have a

full feature set for the advanced planetary observer. While *ECU* lacks some of the polish that other software offers, the advantages of the old engineer's mantra, "Keep it simple, Stupid," really become clear at night in the cold. If your requirements include observing mostly NGC and Messier objects and checking out the planets from time to time, *ECU* will not let you down.

Guide,* from Project Pluto, has attracted loyal users all over the world, many of whom eagerly awaited the availability of the new 32-bit Version 7 for Windows 95/98. It does not disappoint. *Guide* is

Sky-Charting Software

Program	TheSky	SkyChart III	SkyTools	Earth Centered Universe	Guide	MegaStar Sky Atlas	Deep Space	SkyMap Pro	Starry Night Deluxe
Version	5.0, Level IV	3.1	1.0	3.0	7.0	4.0	5.56	5.0	2.1
Price	\$249	\$39.95	\$99	\$55	\$89	\$129.95	\$79	\$89	\$89.95
Platform	Win32, Mac	Win32, Mac	Win32	Win	DOS, Win, Win32	Win	DOS	Win32	Win32, Mac
Star Catalogs	TH, GSC	Sky2K, GSC	Integrated	YBSC, SAO, GSC	TH, GSC	TH, PPM, GSC	SM, GSC	TH, GSC	SAO, GSC
Deep-Sky-Object Score	A	B	A	B	A	A	B	A	B
Customization Score	A	A	A	B	B	B	A	A	A
Telescope Control	A	A	—	B	A	B	B	A	Not tested
Printed Manual	A	*	*	A	A	A	A+	A	B
RealSky Overlay	√	—	—	—	√	√	—	√	√
User-Added Catalogs	√	√	—	—	√	√	—	√	√
Conjunction Finder	—	√	√	—	√	—	—	—	—
Observing Lists	**	—	√	—	**	**	√	**	—
Satellite Tracking	√	√	—	—	√	—	—	—	√
Rendered Planet Surfaces	—	—	√	—	√	—	—	—	√
Ephemeris Generator	—	√	√	—	√	√	√	√	—

Platform: Win = 16-bit Windows 3.1; Win32 = 32-bit Windows 95/98/NT

Star Catalogs: YBSC = *Yale Bright Star Catalogue*; SAO = *Smithsonian Astrophysical Observatory*; TH = *Tycho/Hipparcos*; GSC = *Hubble Guide Star Catalog*; PPM = *Positions and Proper Motions*; SM = *NASA Skymap Database*; Sky2K = *NASA Sky2000 Master Star Catalog*; Integrated = Various catalogs in proprietary format

Deep-Sky-Object Score: Based on number of objects and integrity of data sources. "B" scores often have Saguaro Astronomy Club database only.

Customization Score: Based on amount of control over chart (including field selection and displayed objects) and ease of applying such control.

Telescope Control: Based on number of telescopes supported, ease of use, and architecture of interface.

* All documentation is contained within program.

** Allows exporting data, sometimes with filters, but not lists sorted in observing order.

known for being one of the most feature-rich star-charting programs available, and learning *Guide* is akin to being a kid again in a candy store. It is also the only program in this review that uses hyperlinks when displaying data about celestial objects. Among the many advanced features that *Guide* offers are occultation predictions, error estimates for the positions of minor planets, manual or batch-mode astrometric reduction, and routines that match images to star charts.

Alas, with *Guide*, the vast functionality and complexity are offset by an awkward interface. In some cases it is unaccountably counterintuitive. It takes time to learn, and then a bit longer to explore all the areas of this program. Once that was done, I became quite comfortable with it. *Guide* is especially well suited to the observer who has specific research needs, but it will also serve the advanced deep-sky or solar-system observer admirably.

MegaStar Sky Atlas, like *Guide*, is also available in a new release. This program has long been the choice of dedicated deep-sky observers in the southwestern United States. The dedication of its users springs from the large collection of deep-sky data, some of which is proprietary to the program. The charts are attractive

and the interface easily learned. A single click on a plotted object brings up an information box that contains all the data that would be useful to the observer, and then some. An

especially nice feature of *MegaStar* is that the right-ascension and declination indicators appear at the sides of the screen, not as a grid.

But *MegaStar* comes with some rough edges. While I was annoyed that my name was unaccountably misspelled in the title bar no matter how many times I reinstalled the program, the worst problems were ones that made it harder to use than necessary. For example, by default, before the program will show planets or allow me to search for or view information about them, I had to manually tell the program to calculate planetary positions. This extra step is bothersome and not necessary with other programs. Technical support may be another issue with *MegaStar*. Of all the companies I contacted to evaluate technical support services, it was the slowest to respond.

Deep Space,* from David Chandler Co.,

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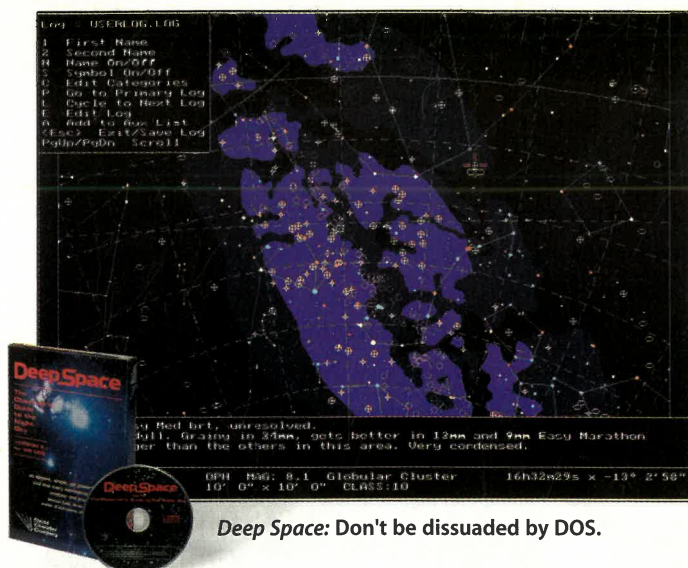
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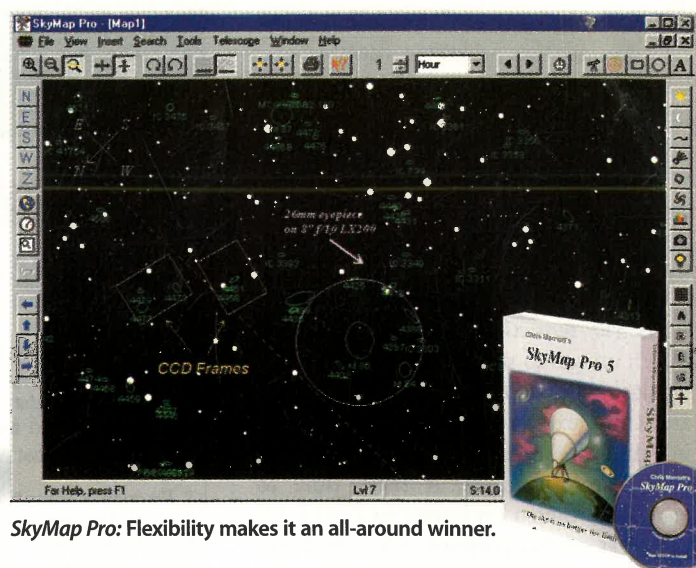
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Deep Space: Don't be dissuaded by DOS.



SkyMap Pro: Flexibility makes it an all-around winner.

is a lightning-fast charting application with the usual standard features and also a supply of novel and illuminating capabilities. Three-dimensional plots of star fields and the solar system, basic observing lists and logs, and the ability to view orbits from outside the solar system are a few of these. The combination makes it a useful program at the telescope and in the classroom or astronomy-club meeting. The printed manual is also a delight to read, offering details about how the program

works and a lot of supporting information. The care and attention that have gone into this program impressed me greatly.

Although *Deep Space* is a DOS program, I had no trouble running it under Windows 95, 98, and NT 4. It doesn't require much in the way of hardware to operate effectively. I even found it quite tolerable on an old computer with a 386 processor I had in my closet. *Deep Space* is especially well suited for the observatory computer, if that machine is an old, hand-

me-down family PC. While I anticipated problems printing charts considering the DOS-based printing drivers, I had none using several old printers.

One of the gems of my evaluations proved to be **SkyMap Pro**.^{*} Since I use it for my own observing, I was eager to see how it stacked up against a competitive field. To control my own biases, I had several astronomy-club buddies look at it as well. Foremost among *SkyMap*'s strongpoints are its forthright interface and powerful control over map displays. The printed maps were the most attractive of any program reviewed, similar to high-quality printed atlases. Every part of this program is receptive to user customization, right down to extensive options in object labeling. For the price, this program is hard to beat.

SkyMap's biggest drawback is speed of execution. The program uses calculation methods that result in high-accuracy plotting, and this makes the program rather slow to run, even on high-end 486 processors. A couple of interface features also get in the way at times. For example, after searching for and finding an object, it is highlighted with a distracting white square that has to be removed manually. Yet the occasional rough edge does not detract too much from an otherwise excellent program.

When it comes to photorealism, the clear winner is Sienna Software's **Starry Night Deluxe**.^{*} The program spares no effort to offer realistic or spectacular views of the solar system. It offers amazing flexibility in selecting the observer's location, such as any topocentric location on any planet or major satellite, as well as an infinite array of positions

Software Sources

Astronomical Society of the Pacific, 390 Ashton Ave., San Francisco, CA 94112; 415-337-1100; fax: 415-337-5205; www.aspsky.org.

CapellaSoft, P.O. Box 1182, Cloudcroft, NM 88317; 888-422-7355, 505-682-1183; info@skyhound.com; www.skyhound.com.

David Chandler Co., P.O. Box 999, Springville, CA 93265; 559-539-0900; fax: 559-539-7033; david@davidchandler.com; www.davidchandler.com.

Nova Astronomics, P.O. Box 31013, Halifax, NS B3K 5T9, Canada; 902-499-6196; fax: 902-826-7957; info@nova-astro.com; www.nova-astro.com.

Project Pluto, 168 Ridge Rd., Bowdoinham, ME 04008; 800-777-5886, 207-666-5750; fax: 207-666-3149; pluto@projectpluto.com; www.projectpluto.com.

Sienna Software, 411 Richmond St. E, Suite 303, Toronto ON M5A 3S5, Canada; 800-252-5417, 416-410-0259; fax: 416-410-0359; contact@siennasoft.com; www.siennasoft.com.

SkyMap Software, 9 Severn Rd., Culcheth, Cheshire WA3 5ED, United Kingdom; sales@skymap.com; www.skymap.com. (Distributed in United States and Canada by World Wide Software Publishing, P.O. Box 202036, Bloomington, MN 55420; order@wwsoftware.com; www.wwsoftware.com.)

Software Bisque, 912 12th St., Golden, CO 80401; 800-843-7599, 303-278-4478; fax: 303-278-0045; smb@bisque.com; www.bisque.com.

Southern Stars Software, P.O. Box 3792, Saratoga, CA 95070; 408-973-1016; info@southernstars.com; www.southernstars.com.

Willmann-Bell, Inc., P.O. Box 35025, Richmond, VA 23235; 804-320-7016; fax: 804-272-5920, www.willbell.com.

above the planets' surfaces. This is the program to use if you want to ride a comet through the inner solar system or watch the Earth wobble back and forth from the perspective of a Moon-bound observer. The *Starry Night* experience is stunning and not to be missed.

Surprisingly, this program ran quite well on my older computers, with perfectly acceptable performance from a three-year-old processor. Where I did not like *Starry Night* was in the field. I found it difficult to get an easily readable chart for star-hopping under the night sky. I did not enjoy fighting with labeling controls in the cold. While I could put the program to practical use as a star-hopping tool, I found it more difficult than I would have liked. But the payoff of this program, the sheer fun of using it to explore a virtual solar system, is enough reward.

Finally, I examined *RealSky*,* from the Astronomical Society of the Pacific. I considered this the 10th product for the roundup, but it's a different animal. It nevertheless deserves mention in this context. The two editions of *RealSky* — \$250 each or \$450 for both — are electronic versions of Schmidt camera plates. The northern version is the venerable National Geographic-Palomar Observatory Sky Survey and the southern version is from the U.K. Schmidt Survey made at Siding Spring Observatory in Australia.

The photographic sky survey — digitized and stored on eight (north) and 10 (south) CD-ROMs — includes stars fainter than 20th magnitude and uncounted millions of nonstellar objects, most of which are galaxies. Each edition also has a disc containing *RealSkyView* and various lists and indexes, which are used to display the desired part of the atlas. This product makes no pretensions to being anything but a digitized photographic atlas. It does not show planets or asteroids, nor does it use star or deep-sky-object catalogs for plotting purposes. Instead, the digitized photographs speak for themselves.

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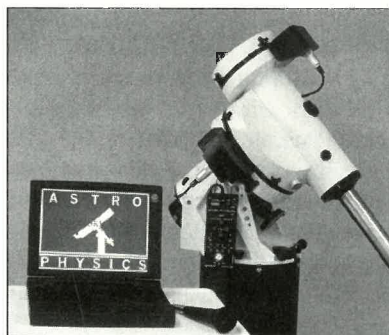
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RealSkyView allows you to select a part of the sky to display and the size of the field. The program is fairly limited in field size; in general anything over 45 arc-minutes wide takes quite a while to pop up. Don't expect to use *RealSky* to generate wide-field vistas. *RealSkyView* can use any of several included lists, which make it easy to quickly center a desired object in the field, but I found it much easier to simply provide the coordinates than to select from a collection of lists.

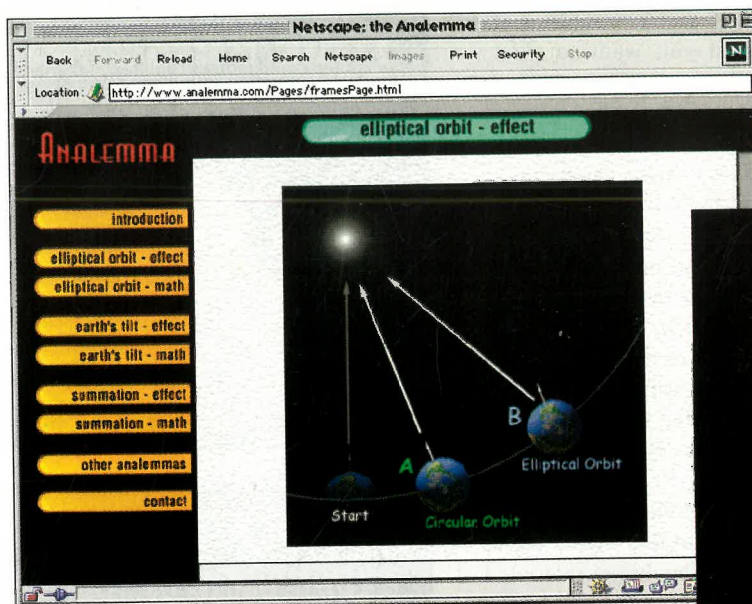
RealSky is best suited to advanced deep-sky observers and amateurs who are conducting minor-planet astrometry. Astrophotographers and CCD imagers will also appreciate the ability to compare their images with this premier reference atlas. But *RealSky* comes into its own when coupled with any of several of the other products reviewed here. I imported images directly into *Guide* (see the right-hand image on page 80), *MegaStar*, *SkyMap*, and *TheSky* and overlaid charts on them. It is much easier to orient the photograph if it is displayed under a familiar chart, and it is simple to identify objects and discern mistakes in deep-sky catalogs when this is done.

The Picks

If I had to pick just one program from this review to recommend to a friend, I would have to do so by evaluating the intended uses. The clear winner for robotic telescope control is *TheSky* with its companion programs. The budget-minded shopper, or the owner of an older computer, couldn't go wrong with the easy-to-learn *SkyChart III*. *Guide* has a clear advantage for minor-planet astrometrists and other technically accomplished observers, and its host of features is not likely to leave anyone disappointed.

But *SkyMap* remains my pick, and my recommendation for general observers. The flexibility of the program makes it well suited to almost any style of observing, whether it be picking off deep-sky objects, making detailed planetary observations, or controlling a telescope for CCD imaging. Considering its feature richness, the technical support behind it, the reliable ongoing development, and particularly the price, this program is hard to beat.

JEFF MEDKEFF gave up his Midwestern big-city profession as a network topologist for a small scientific-computing consulting practice and the dark skies of rural Arizona. He is an avid amateur astronomer and telescope maker. He welcomes correspondence at medkeff@c2i2.com.



Robert Urschel's analemma page is an eye opener.

astronomy online | By Stuart J. Goldman

Analemma Dilemmas

IT'S REALLY SATISFYING, AFTER COMING up with a question, to make a stab in the dark with your Web browser and find the answer immediately. *Sky & Telescope* subscriber Dan Kalikow of Natick, Massachusetts, had this satisfaction when his daughter announced that it was about time she learned about the figure-eight shape on his recently purchased globe. She had long noticed the same figure eight made of Suns in the sky in a photograph on his wall.

So to help his daughter, he performed a simple Web search that turned up the obvious URL of "www.analemma.com." In a few seconds he was looking at the well-conceived site of Robert Urschel of Valparaiso, Indiana, who created a multimedia tutorial about what an analemma is and why it looks the way it does. Through the use of QuickTime animations, Urschel illustrates the effects of Earth's noncircular orbit and tilted axis on where the Sun appears in the sky if you look at the same clock time every day.

The site had all the information Kalikow and his daughter needed. "What a masterful job!" he writes. Not only does Urschel provide a graphical overview of what causes the analemma, but he includes all the supporting mathematics for those wanting a truly thorough explanation.

The most fascinating aspect of the site is

the interactive analemma generator, which allows you to input any axial tilt and orbital eccentricity and see how Earth's analemma changes. Throw caution to the winds and see just how bizarre the analemma would be if the Earth had a life-challenging orbital eccentricity of 0.5 and the poles were inclined 85°.

Urschel has an open e-mailbox for suggestions. I have a couple that would make the site a more complete resource. A question often asked of the *Sky & Telescope* editors this time of year is why the year's earliest sunrise and latest sunset come many days before and after, respectively, the longest day at the June solstice. (We get a similar swell of questions around the December solstice.) The least time-consuming way to explain this disparity is to have a picture of the analemma handy, as described in the December 1998 issue of this magazine (page 124). The answer has to do with how the analemma is tipped with respect to the horizon as seen from your latitude.

My other suggestion is to expand the analemma examples to include those of the other planets. As explored in the March 1982 issue (page 237), these extraterrestrial analemmas aren't as weird as the ones you can create with Urschel's simulator, but they will surely be of interest to the Mars colonist in us all.